DOPPLER NAVIGATION CONTROL UNIT TEST PANEL

578M-1

INSTRUCTION BOOK

COLLINS RADIO COMPANY

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(E) Unit sub-assembly number (where applicable)

DOPPLER NAVIGATION CONTROL UNIT TEST PANEL

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RECORD OF REVISIONS

Doppler Navigation Control Unit Test Panel 578M-1	LOCATION
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ON RECEIPT OF REVISIONS, INSERT REVISED PAGES IN THE MANUAL, AND ENTER DATE INSERTED AND INITIALS.

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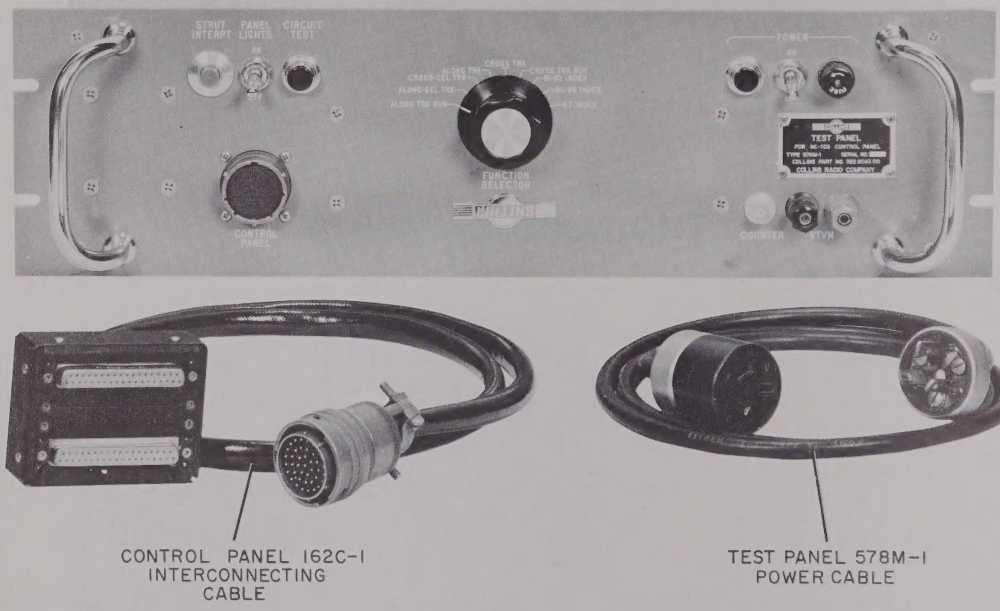

Figure 1-1. Test Panel 578M-1 and Associated Cables

SECTION I
GENERAL DESCRIPTION

1.1 PURPOSE OF THE MANUAL.

This manual describes Test Panel 578M-1. Topics which are discussed include a general description of the equipment, installation, operation, principles of operation, maintenance, and an illustrated parts list.

The purpose of this manual is to aid the operator in understanding the operation of Test Panel 578M-1, and to help him locate, analyze, and prescribe remedies for possible troubles. Figure 1-1 illustrates the Test Panel 578M-1 and associated cables.

1.2 PURPOSE OF THE EQUIPMENT.

Test Panel 578M-1 provides the interconnections, power and the signal simulation necessary to bench test Control Panel 162C-1. Control Panel 162C-1 is a part of Collins Doppler Navigation Computer System NC-103. A front panel view of Control Panel 162C-1 is shown in figure 1-2.

TABLE 1-1
EQUIPMENT SUPPLIED

ITEM	MANUFACTURER AND PART NUMBER
Test Panel 578M-1	Collins Radio Company 522-2063-00
Power cable	Included
Interconnecting cable	Included

TABLE 1-2. TEST EQUIPMENT REQUIRED BUT NOT SUPPLIED

ITEM	MANUFACTURER AND PART NUMBER	FUNCTION
A-C Vacuum Tube Voltmeter	Ballantine, Model 300	Location of synchro nulls.
Volt-Ohm-Milliammeter	Triplett, Model 630	Check d-c voltage input to 578M-1 and servo amplifier.
Control Panel 162C-1	Collins Radio Company 522-1589-00	Check operation of 578M-1.
Audio Oscillator	Hewlett-Packard 200DR	Supply input signal for testing servo amplifier.
Servo Amplifier Module Test Jig (figure 5-2)	(Must be fabricated)	Supply bias and connect input signal to servo amplifier.

1.3 DESCRIPTION OF THE EQUIPMENT.

1.3.1 GENERAL.

Test Panel 578M-1 supplies 26 volts, 400 cps; 28 volts d-c to Control Panel 162C-1. The 578M-1 also supplies 6.3 volts a-c to jack J4 as a timing signal to an external counter, and 12 volts, 400 cps to the 162C-1 as a position signal for purposes of nulling the control transformers. The 578M-1 contains circuitry for indexing synchros and checking the stage switching; for checking along-track and cross-track dial mechanisms, the lighting system, and inadvertent grounds on the Control Panel 162C-1.

The 578M-1 can be mounted on a standard 19-inch relay rack or used on the bench. Two crash bars are mounted on the front panel to provide equipment protection and a carrying convenience.

The 578M-1 is supplied with a power cable and interconnecting cable. The power cable mates with the power connector J2, MS3102A-105L-3P, located on the back of the 578M-1. The interconnecting cable connects Control Panel 162C-1 to the 578M-1. The interconnecting cable consists of two Cannon DC-37S connectors which mate with two Cannon DC-37P connectors on Control Panel 162C-1. A PT06A-20-41P connector on the interconnecting cable mates with the PT02A-20-41S connector J3 located on the front panel of the 578M-1 to complete the connection of Control Panel 162C-1 to the 578M-1.

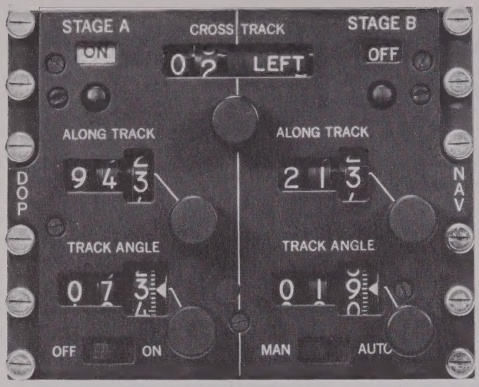

Figure 1-2. Control Panel 162C-1, Front Panel View

1.3.2 SPECIFICATION SUMMARY.

Power Required . . .	115 volts ±10 percent, single phase 400 cps ±5 percent, at approximately 1 ampere.
Size	19 inches wide by 5-1/4 inches high by 6-1/4 inches deep.
Weight	12 pounds, excluding cables.

1.4 RELATED PUBLICATIONS.

Additional information on Collins Doppler Navigation Computer System NC-103 is available from Collins Radio Company. An instruction book has been prepared which describes complete overhaul procedures, theory of operation, maintenance practices, and descriptive material for the NC-103. When ordering, specify Collins part number 520-5998-001.

SECTION II
INSTALLATION

2.1 UNPACKING.

Unpack Test Panel 578M-1 with care, and inspect for possible damage. If a claim for damage is filed with the transportation agency, it is advisable to retain the shipping carton.

After the equipment has been unpacked and checked for visible shipping damage, it should be subjected to the test outlined in the operation section of this manual. The purpose of this test is to determine the operating condition of the 578M-1.

2.2 INSTALLATION.

The 578M-1 can be mounted in a standard 19-inch relay rack or used on the bench.

2.2.1 COOLING REQUIREMENTS.

When mounted in a standard 19-inch relay rack, the 578M-1 requires no cooling other than that provided by convection. Other equipment mounted in the rack should be separated from the 578M-1 by a minimum vertical distance of 1-3/4 inches (standard A panel) to provide adequate ventilation. If equipment mounted below the 578M-1 generates a large amount of heat, it may be necessary to provide a rack blower to keep the temperature of the 578M-1 below a maximum operational ambient temperature of 104°F (40°C). If the 578M-1 is non-operational, the maximum permissible ambient temperature range may be extended to 160°F (71°C).

SECTION III
OPERATION

3.1 GENERAL.

This section describes a procedure for using Test Panel 578M-1 to test Control Panel 162C-1. Table 1-2 identifies the test equipment required to test the 578M-1. A front panel view of Test Panel 578M-1 is found in figure 1-1. A schematic diagram of 578M-1 is found in figure 7-1. A front panel view of the Control Panel 162C-1 is found in figure 1-2.

3.2 FRONT PANEL CONTROLS.

All controls are located on the front panel of the 578M-1. Table 3-1 lists each control of the 578M-1 and describes its function.

TABLE 3-1. TEST PANEL 578M-1 CONTROL FUNCTIONS*

CONTROL	FUNCTION
POWER	Activates the 578M-1 in ON position.
FUNCTION SELECTOR	Selects various circuits within Control Panel 162C-1.
PANEL LIGHTS	Activates Control Panel 162C-1 panel lighting circuits in ON position.
STRUT INTERPT	Provides means of checking circuitry associated with landing gear strut switch.
*Refer to the Principles of Operation section of this manual for further information.	

A CIRCUIT TEST indicator, COUNTER jack and two VTVM jacks are also provided on the front panel of the 578M-1. The CIRCUIT TEST indicator provides a visual indication when the Control Panel 162C-1 switches from stage to stage, and also provides a warning in case of inadvertent grounding. The COUNTER jack, BNC jack, type UG-261 B/U, permits connection of an external counter. The VTVM jacks permit connection of an external a-c vtvm.

3.3 POWER SOURCE REQUIRED.

The power source shall be capable of supplying approximately one ampere at 115 volts 400 cps to the 578M-1. This power source should be maintained to 115 volts ±10 percent single phase, 400 cps ±5 percent.

3.4 TEST PROCEDURE.

3.4.1 PRELIMINARY.

a. Connect the 162C-1 to the front panel connector on Test Panel 578M-1 marked CONTROL PANEL using the interconnecting cable. Connect Test Panel 578M-1 to the 115-volt 400-cps power supply with the power cable.

b. Position the POWER switch and PANEL LIGHT switch on the 578M-1 to ON position. The lighting panel of the 162C-1 should become uniformly illuminated. The CIRCUIT TEST and POWER panel lights on 578M-1 should also be illuminated.

3.4.2 STAGE SWITCHING RESPONSE.

a. Set both 162C-1 ALONG TRACK displays to 000, OFF-ON switch to ON, and MAN-AUTO switch

TABLE 3-2
INITIAL SWITCH POSITIONS ON
TEST PANEL 578M-1

SWITCH	POSITION
PANEL LIGHTS	ON
FUNCTION SELECTOR	ALONG TRK RUN
POWER	ON

to MAN. Position the switches of the 578M-1 as indicated in table 3-2.

b. Depress STAGE A transfer button of the 162C-1. STAGE A flag should indicate ON, and STAGE B flag should indicate OFF.

NOTE

The CIRCUIT TEST lamp should normally be lighted, but will be momentarily off when either stage is switched.

c. STAGE A ALONG TRACK display should decrease, and all other displays on the 162C-1 should remain fixed.

d. Depress STAGE B transfer button. STAGE B flag should indicate ON, and STAGE A flag should indicate OFF.

e. STAGE B ALONG TRACK display should decrease, and all other displays on the 162C-1 should remain fixed.

f. Depress the STRUT INTERPT button on 578M-1. Both the STAGE A and STAGE B flags should read OFF.

g. Position the MAN-AUTO switch on the 162C-1 to the AUTO position. Adjust the ALONG TRACK displays of both stages on the 162C-1 to 005 using the ALONG TRACK display controls. When the active stage (STAGE B) ALONG TRACK display runs down to indicate 000, the 162C-1 should transfer to the inactive stage (STAGE A).

h. Readjust STAGE B ALONG TRACK display to indicate 005, before STAGE A ALONG TRACK display indicates 000, and repeat step g. Both STAGE A and STAGE B ALONG TRACK displays should stop at 000.

3.4.3 CORRECT SELECT TRACK ROTATION REFERENCE.

a. Position the FUNCTION SELECTOR to ALONG-SEL TRK position.

b. Set the ALONG TRACK displays of both stages for a three-mile indication. Position the MAN-AUTO switch on the 162C-1 to MAN, then depress STAGE A transfer button. Return the MAN-AUTO switch to the AUTO position. Rotate STAGE A TRACK ANGLE display control for increasing TRACK ANGLE indications. STAGE A ALONG TRACK display indications should decrease for increasing TRACK ANGLE indications. As STAGE A of the 162C-1 approaches 000, and transfer occurs from STAGE A to STAGE B, the CIRCUIT TEST lamp, located on the 578M-1, should momentarily light. This checks for proper operation of relay K2 located within the 162C-1.

c. Rotate STAGE B TRACK ANGLE display control for increasing TRACK ANGLE indications. STAGE B ALONG TRACK display indications should decrease for increasing TRACK ANGLE indications. As STAGE B of the 162C-1 approaches 000, and transfers to STAGE A, the CIRCUIT TEST lamp located on the 578M-1 should light as before.

3.4.4 CORRECT CROSS TRACK ROTATION.

a. Switch the FUNCTION SELECTOR on the 578M-1 to CROSS TRK RUN.

b. Rotate the CROSS TRACK display control on the 162C-1 to a CROSS TRACK display indication of 99 LEFT. A mechanical stop will prevent the CROSS TRACK display from proceeding beyond 99 LEFT. The CROSS TRACK display should proceed toward RIGHT 99.

3.4.5 CORRECT CROSS TRACK ROTATION REFERENCE.

a. Switch FUNCTION SELECTOR on the 578M-1 CROSS-SEL TRK, and switch the MAN-AUTO switch on the 162C-1 to MAN position.

b. Observe the CROSS TRACK display on the 162C-1. The CIRCUIT TEST lamp on Test Set 578M-1 should light. This is not an indication of a failure.

c. Turn STAGE A TRACK ANGLE display control for increasing TRACK ANGLE indications. Vary STAGE A TRACK ANGLE display over the full 360-degree range using the TRACK ANGLE display control. The CROSS TRACK indication should increase to the RIGHT and decrease to the LEFT.

d. Check for proper operation of ON-OFF switch on the 162C-1 by observing the CIRCUIT TEST lamp. The lamp is lighted when the ON-OFF switch is in the ON position, and extinguished when the ON-OFF switch is in the OFF position.

3.4.6 ALONG TRACK REPEATER ROTATION REFERENCE.

a. Set FUNCTION SELECTOR on the 578M-1 to ALONG TRK. The CIRCUIT TEST lamp in Test Set 578M-1 should extinguish.

b. Rotate STAGE A TRACK ANGLE display control to 000 TRACK ANGLE display indication.

c. Rotate STAGE A ALONG TRACK display control to 510 ALONG TRACK display indication. The ALONG TRACK display of STAGE A should proceed toward 500.

d. Rotate STAGE B TRACK ANGLE display control to 000 TRACK ANGLE display indication, and depress STAGE B transfer button. Rotate STAGE B ALONG TRACK display control to 510 ALONG TRACK display indication. The ALONG TRACK display of STAGE B should proceed toward 500.

3.4.7 CROSS TRACK DEVIATION ROTATION REFERENCE.

a. Switch the FUNCTION SELECTOR on the 578M-1 to CROSS TRK.

b. Rotate the CROSS TRACK display control on the 162C-1 to a CROSS TRACK display indication of RIGHT 05. The CROSS TRACK display should proceed to 0000 ±0.2 mile.

3.4.8 CHECKING ELECTRICAL ALIGNMENT OF SYNCHRO TRANSMITTERS.

3.4.8.1 SYNCHRO TRANSMITTERS B1 AND B2. Switch FUNCTION SELECTOR on the 578M-1 to B1-B2 INDEX. Connect a suitable a-c vtvm. See table 1-2. Rotate the TRACK ANGLE display control of STAGE B to a null indication of approximately 30 mv on the a-c vtvm. STAGE B TRACK ANGLE display should indicate 000 ±0.1. Depress STAGE A transfer button, and rotate STAGE A TRACK ANGLE display control to a null indication of approximately 30 mv on the a-c vtvm. STAGE A TRACK ANGLE display should indicate 000 ±0.1.

3.4.8.2 SYNCHRO TRANSMITTERS B4 AND B5. The a-c vtvm should remain connected to the VTVM jacks. Position the FUNCTION SELECTOR to B4-B5 INDEX. Position STAGE A ALONG TRACK display to a null indication of approximately 30 mv on the a-c vtvm. STAGE A ALONG TRACK display should indicate 000 ±1/2. Depress STAGE B transfer button. Position STAGE B ALONG TRACK display to a null indication of approximately 30 mv on the a-c vtvm. STAGE B ALONG TRACK display should indicate 000 ±1/2.

3.4.8.3 SYNCHRO RESOLVER B7. The a-c vtvm should remain connected to the VTVM jacks. Position the FUNCTION SELECTOR to B7 INDEX. STAGE B of the 162C-1 should remain active. Position the CROSS TRACK display for a null of approximately 30 mv as indicated on the a-c vtvm. The CROSS TRACK display should indicate 0000 ±1/2.

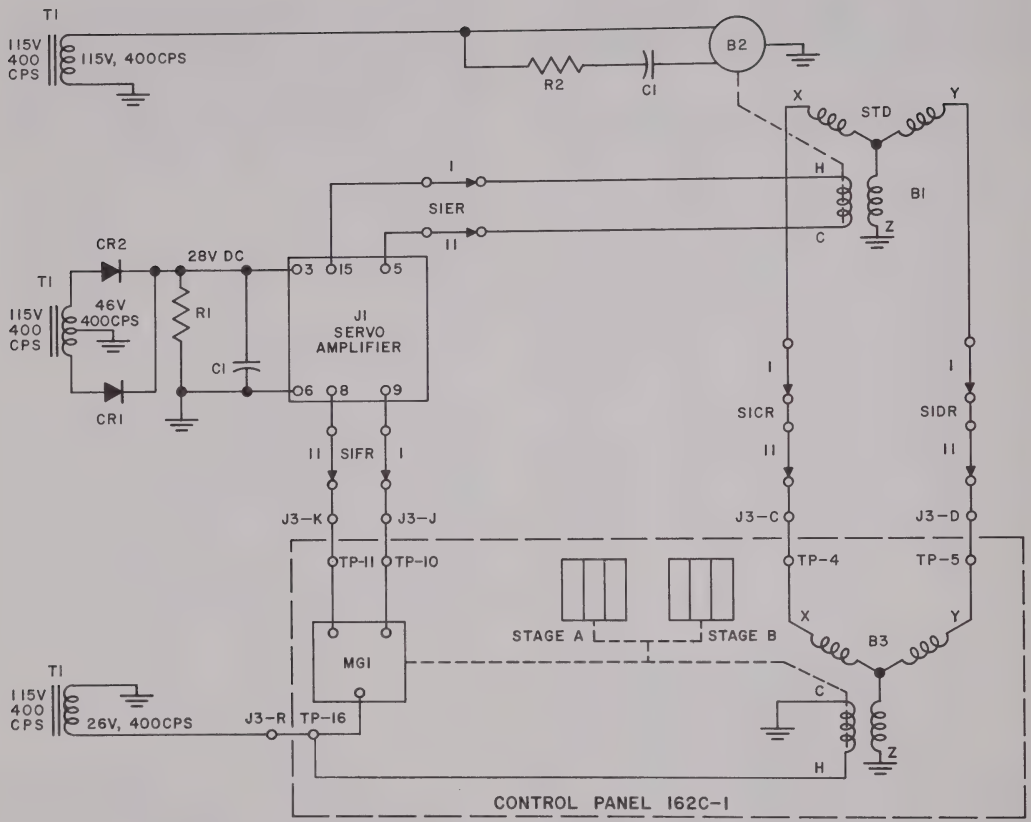

Figure 4-1. ALONG TRK RUN, Simplified Schematic Diagram

SECTION IV
PRINCIPLES OF OPERATION

4.1 GENERAL

Test Panel 578M-1 provides the interconnection, power, and the signal simulation necessary to bench test Control Panel 162C-1.

A preliminary discussion of the front panel controls is found in paragraph 3.2. A more thorough explanation of the function of these controls is given in this section.

4.2 CIRCUIT DESCRIPTION.

A description of each circuit within the 578M-1 is given in the following paragraphs. Loop-circuit diagrams are included to aid in understanding each function of the 578M-1.

4.2.1 POWER SOURCES.

Power is supplied to transformer T1 from an external 115-volt, 400-cps power supply. See figure 7-1.

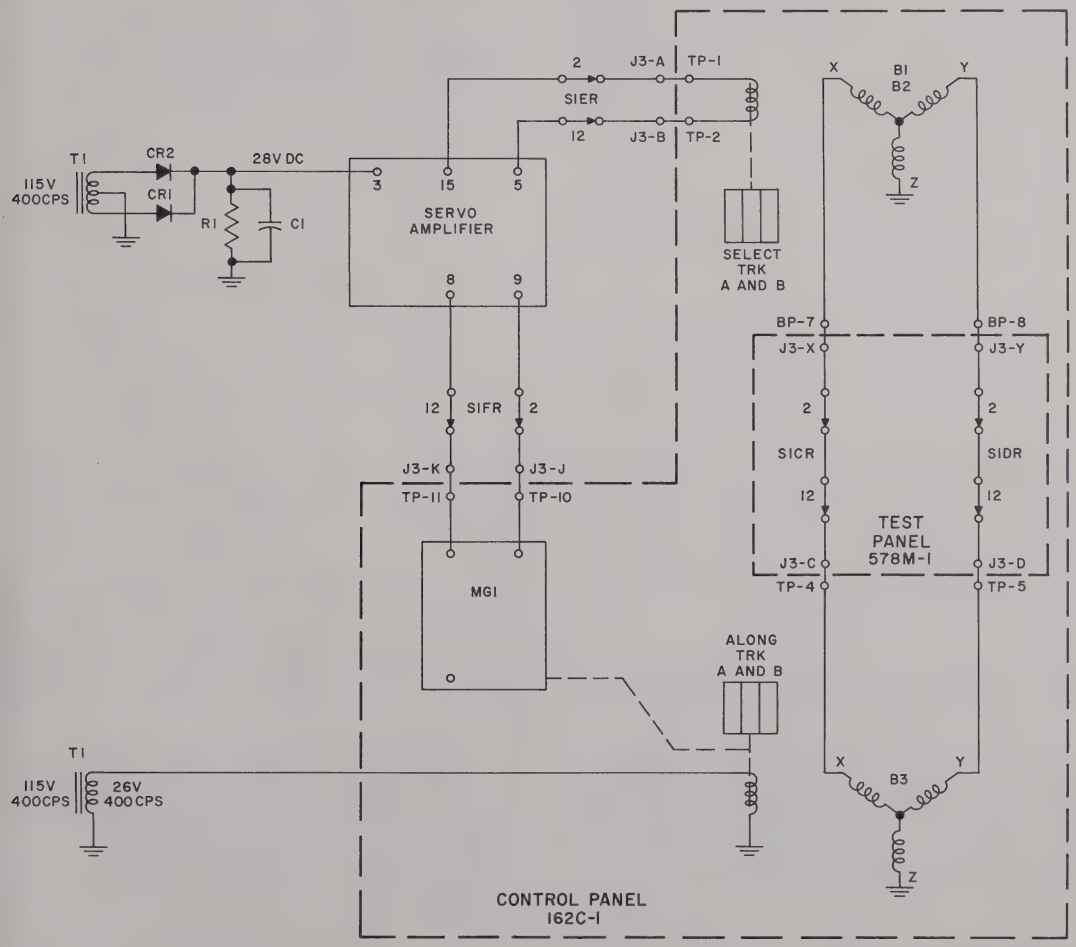

Figure 4-2. ALONG-SEL TRK, Simplified Schematic Diagram

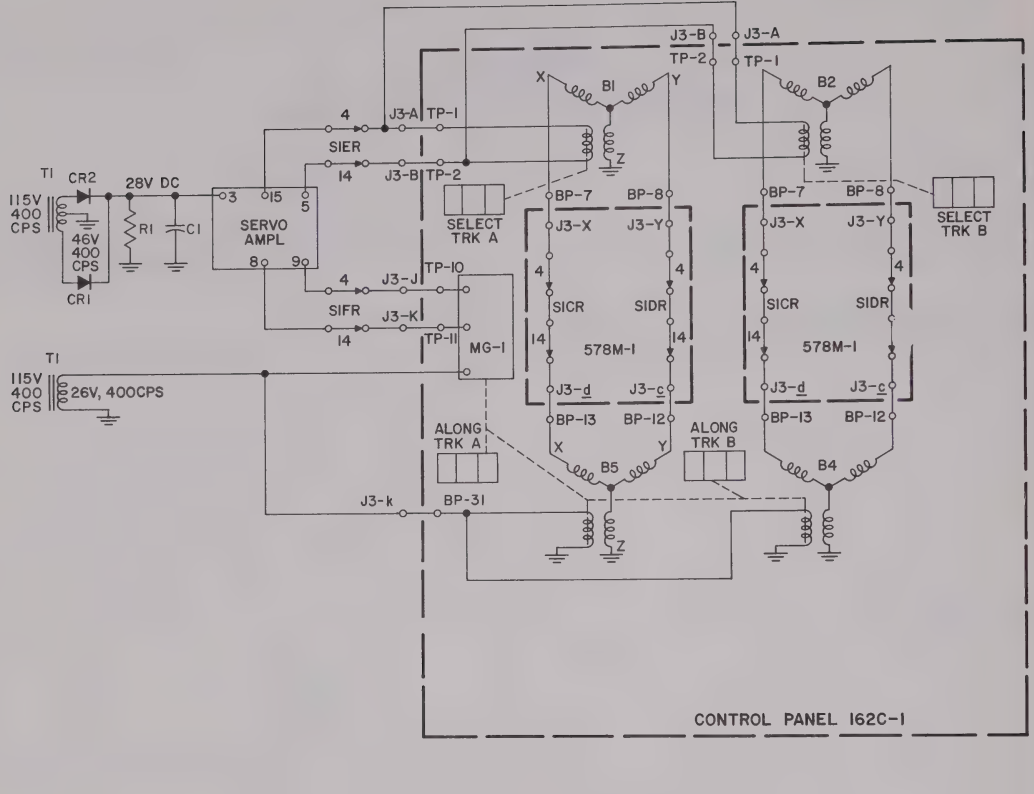

Figure 4-3. ALONG TRK, Simplified Schematic Diagram

The voltage is transformed to 46 volts, 400 cps at terminals 10, 11, and 12 of transformer T1. This voltage is rectified to approximately 28 volts d-c by a full-wave rectifier, consisting of diodes CR1 and CR2. Resistor R1 and capacitor C1 provide a load and filtering network for the rectified output of CR1 and CR2. The 28 volts d-c is applied to pins J3-S and J1-3 of the 578M-1.

The 28 volts d-c is available at pins J3-S and J1-3 for all positions of all switches on the 578M-1 while the POWER switch S2 is in the ON position.

Power is supplied to the synchronous motor, B2, through terminals 3 and 6 of transformer T1. Resistor R2 and capacitor C2 provide an approximate ninety-degree phase shift for one winding of the synchronous motor. The synchronous motor runs continuously while the POWER switch of the 578M-1 is in the ON position.

The 12 volts, 400 cps from terminals 5 and 6 of transformer T1 is applied to the rotor of switch S1BR. This voltage is applied to the X and Y stator windings of synchros B1 and B2 of Control Panel 162C-1 as a position signal when the FUNCTION SELECTOR of the 578M-1 is in the B1-B2 INDEX position.

The 6.3 volts, 400 cps from terminals 7 and 9 of transformer T1 supply power to the POWER and CIRCUIT TEST lamps and the COUNTER jack J4. The 6.3 volts, 400 cps is supplied to J4 as a timing signal used by the external counter to measure the length of time a ground is applied to pins J3-U, J3-e, and a.

Terminals 4 and 6 of transformer T1 supply 26-volt, 400-cps excitation voltage to one winding of each motor generator, MG1 and MG2, and the rotors of each synchro B3, B4, B5, B6, and B7 in Control Panel 162C-1 through pins R, g, and k of the 578M-1 main connector. This excitation voltage is always available as long as the POWER switch is in the ON position.

4.2.1.1 STRUT INTERPT SWITCH. The 28-volt d-c output at pin J3-S of the 578M-1 is applied to pin

TP-21 of Control Panel 162C-1. See figure 4-2. The voltage returns to the 578M-1 through pin BP-18 of 162C-1 and pin J3-f of 578M-1, where it is applied to the STRUT INTERPT switch S3. The STRUT INTERPT switch S3, normally closed, completes the circuit to flag solenoids L1 and L2, and stage switching solenoid L3 within the 162C-1.

Depressing the STRUT INTERPT switch S3 on the 578M-1 de-energizes flag solenoids L1 and L2 of Control Panel 162C-1 causing STAGE A and STAGE B flags to indicate OFF. Also when the stage switching solenoid L3 is de-energized, stage switching by either manual or automatic control cannot occur.

4.2.2 FUNCTION SELECTOR SWITCH.

The FUNCTION SELECTOR switch selects nine circuits to be tested within Control Panel 162C-1. The selection of these nine circuits constitutes a complete test of Control Panel 162C-1.

4.2.2.1 ALONG TRK RUN POSITION. This position interconnects the along track circuitry of both stages of Control Panel 162C-1 with the standard synchro and servo amplifier located in the 578M-1. This position is employed to check the rotational reference of the coupling transmitter B3 to the standard synchro. The along track circuitry is interconnected so that the ALONG TRACK display of the active stage will operate continuously. STAGE switching will occur automatically if the MAN-AUTO switch on the 162C-1 is in the AUTO position.

See figure 4-1. Synchro B3 of Control Panel 162C-1 is connected to the standard synchro in the 578M-1. The rotor of the standard synchro is mechanically linked to the synchronous motor. Therefore, the standard synchro rotor is always rotating which results in a continuous difference signal with a magnitude proportional to the amount of angular difference between the rotors of synchros B3 and the standard synchro. This difference signal appears at pins J1-15 and J1-5 of the servo amplifier. A rate generator signal appears at pin J1-8 of the servo amplifier and is mixed with the difference signal from J1-15. The signal obtained from one winding of the rate generator portion of MG1 has a phase opposed to

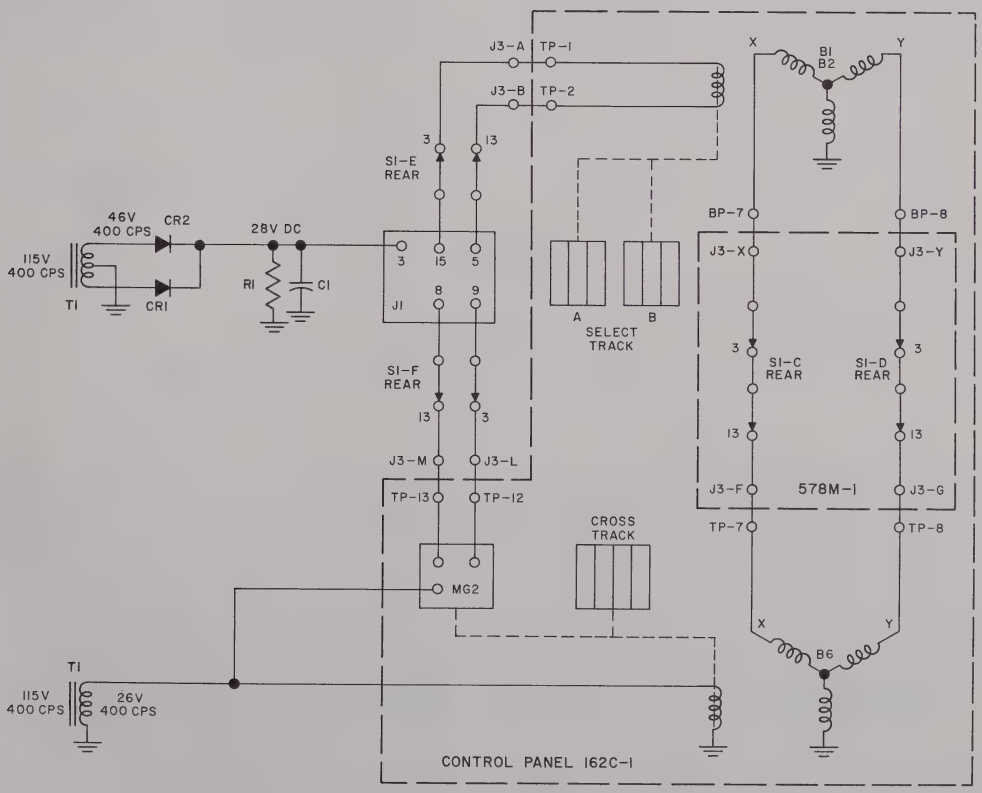

Figure 4-4. CROSS-SEL TRK, Simplified Schematic Diagram

the difference signal and a magnitude proportional to the speed of rotation of the shaft of MG1. The rate generator provides damping signal to the motor portion of MG1.

The difference signal that appears at pin J1-15 is amplified and applied as an a-c control signal to drive the motor of MG1. The shaft of MG1 is mechanically linked to the rotor of synchro B3 and the ALONG TRACK display. Due to a continuous difference signal between the rotors of synchro B3 and the standard synchro, MG1 pinion will always rotate. Therefore, the ALONG TRACK display will continuously operate.

4.2.2.2 ALONG-SEL TRK POSITION. This position interconnects the manually selected track angle circuits with the along track circuits of Control Panel 162C-1. This position is employed to check the rotational reference of the coupling transmitter B3 with the track angle synchros B1 and B2. See figure 4-2.

The stator of synchro B3 in the 162C-1 is connected to the stator of synchro B1 through the switches of the 578M-1. The rotor of synchro B3 is energized with 26 volts, 400 cps. When the rotor of synchro B1 is adjusted to some angular position not equal to the angular position of the rotor of synchro B3, a difference signal proportional to that angular error and the direction of rotation of synchro rotor B1 will appear at pin J1-15 of the servo amplifier. This difference signal will operate motor-rate generator MG1. MG1 is mechanically linked to the rotor of synchro B3 and the ALONG-TRACK display. As a result, MG1 positions synchro rotor B3 to agree with the angular position of synchro rotor B1 and also rotates the ALONG TRACK display dials. When B3 and B1 rotor angular positions are equal, the difference signal disappears from pin J1-15 of the servo amplifier. The control signal from J1-9 to MG1 disappears, and the pinion of MG1 stops rotating.

4.2.2.3 ALONG TRK POSITION. This position interconnects the manually selected track angle circuits with the active along track circuit of Control Panel 162C-1. This position is employed to check the position accuracy of the along track repeaters B4 and B5 against the track angle synchros B1 and B2. See figure 4-3.

With STAGE A of Control Panel 162C-1 active, the stator of synchro B5 is connected to the stator of synchro B1. The rotor of synchro B5 is energized with 26 volts, 400 cps. When the rotor of synchro B1 is adjusted to a given angular position not equal to the angular position of synchro rotor B3, a difference signal appears at the synchro B1 rotor. This difference signal is proportional to the angular error between the two synchro rotors and the direction of rotation of synchro rotor B5. The difference signal

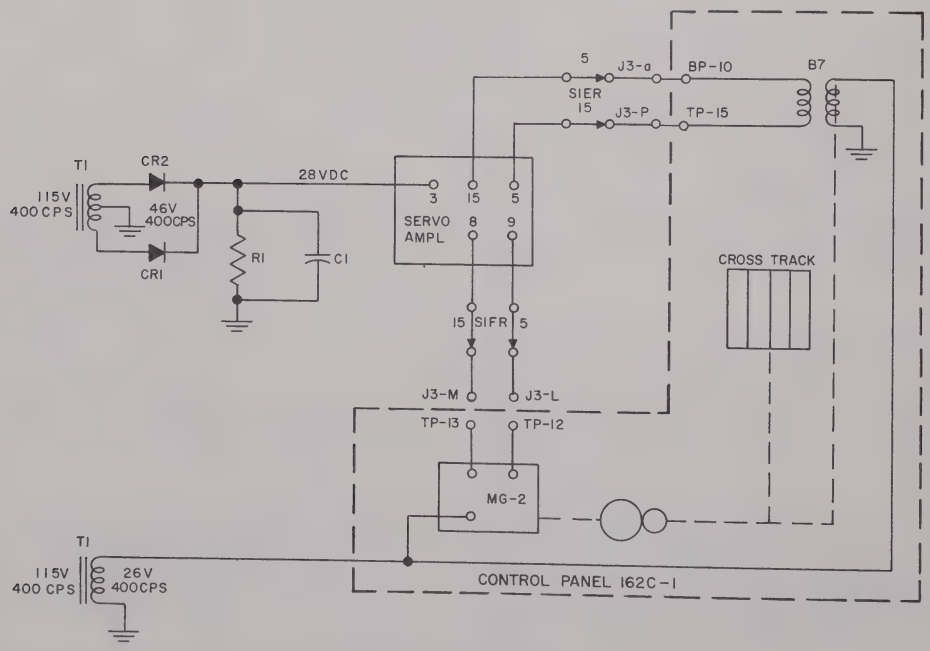

Figure 4-5. CROSS TRK, Simplified Schematic Diagram

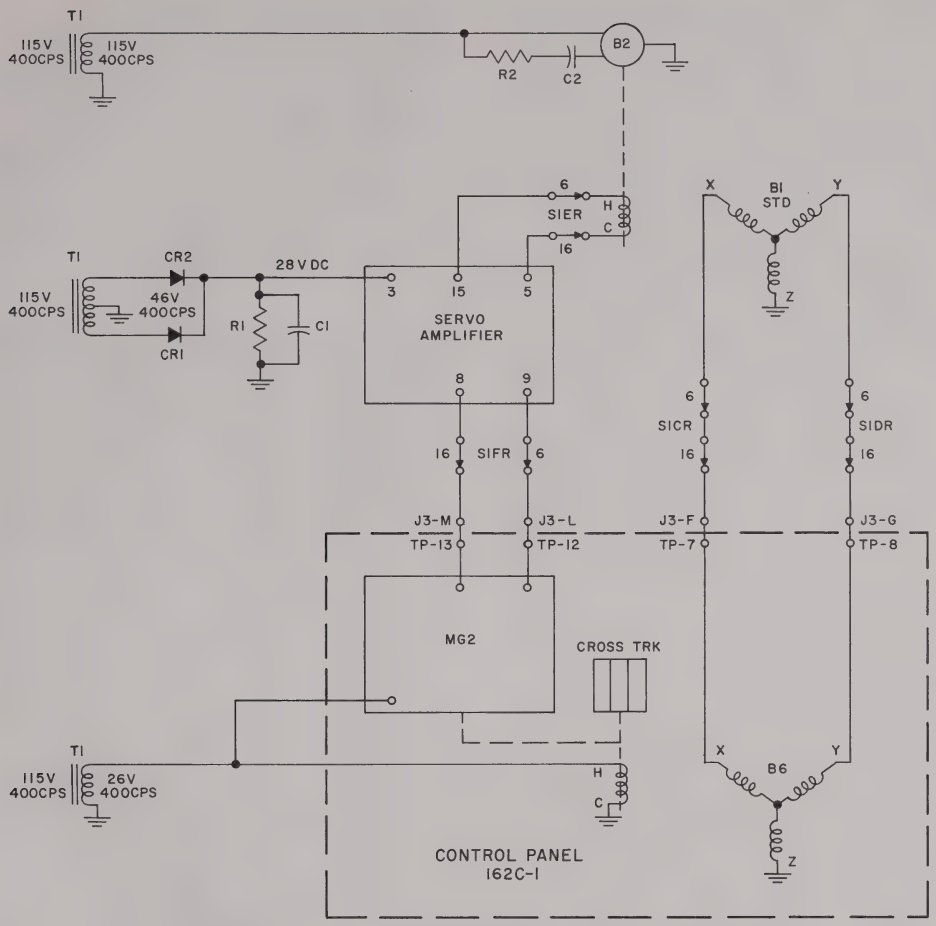

Figure 4-6. CROSS TRK RUN, Simplified Schematic Diagram

ppears at pin J1-15 of the servo amplifier, where it s amplified and applied to the motor portion of MG1 s an a-c control signal from pin J1-9 of the servo mplifier. MG1 is mechanically linked to the rotor f synchro B5 and the STAGE A ALONG TRACK isplay. MG1 positions synchro rotor B5 to the ame angular orientation as the manually adjusted ynchro rotor B1. Through mechanical linkage, the LONG TRACK display also rotates. When the rotors f synchros B5 and B1 agree, the difference signal isappears from pin J1-15 of the servo amplifier. The a-c control signal to MG1 disappears and the inion of MG1 stops. This positions the ALONG TRACK display to correspond to a definite TRACK NGLE display indication. When STAGE B is active, ynchros B4 and B2 are connected, and the rotors f synchros B4 and B2 determine the difference signal.

4.2.2.4 CROSS-SEL TRK POSITION. When the FUNCTION SELECTOR is in the CROSS-SEL TRK position, the manually operated select track circuits are interconnected to the cross track circuits. This position is employed to check the rotational reference of the cross track coupling transmitter B6 with the track angle synchros B1 and B2. See figure 4-4. The principles of operation of this circuit are the same as the ALONG-SEL TRK position of the FUNCTION SELECTOR as explained in paragraph 4.2.2.2 with the exception that synchro B6 replaces synchro B3, and motor-rate generator MG2 replaces MG1.

4.2.2.5 CROSS TRK POSITION. This position interconnects Resolver B7 to motor-rate generator MG2. This position is employed to check the index reference of resolver B7. See figure 4-5. The stator winding of

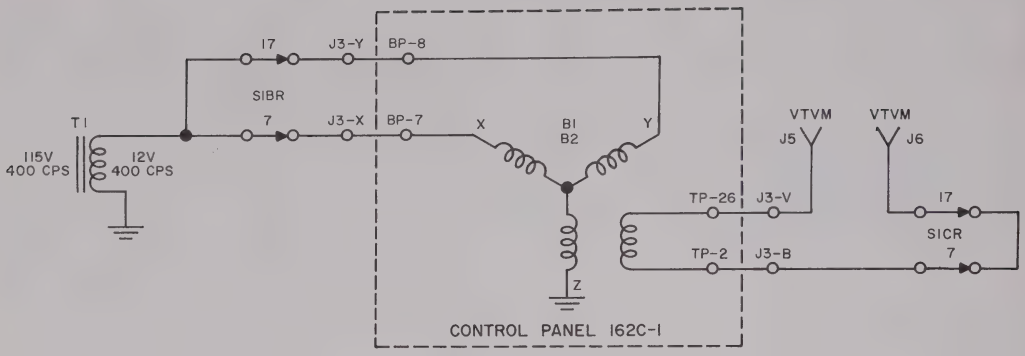

Figure 4-7. B1-B2 INDEX, Simplified Schematic Diagram

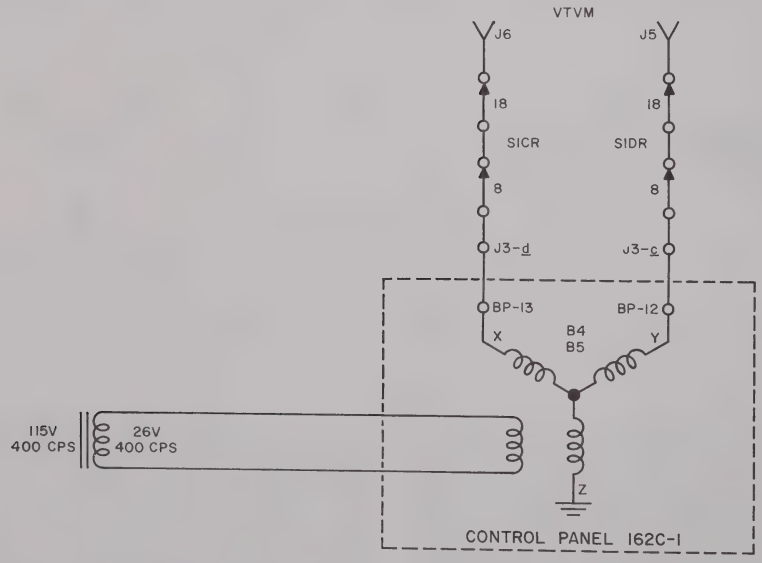

Figure 4-8. B4-B5 INDEX, Simplified Schematic Diagram

resolver B7 is excited with 26 volts, 400 cps. If the rotor winding of resolver B7 is not oriented to a null position, an error signal appears at pin J1-15 of the servo amplifier. The error signal from pin J1-15 is amplified and appears at pin J1-9 as an a-c motor control signal. Motor-rate generator MG2 is mechanically linked to the rotor of resolver B7, and also to the CROSS TRACK display. The mechanical linkage from MG2 causes the CROSS TRACK display dials to rotate. When MG2 drives the rotor of resolver B7 to a null position, the error signal disappears from pin J1-15, thus stopping the pinion of MG2.

4.2.2.6 CROSS TRK RUN POSITION. When the FUNCTION SELECTOR is in the CROSS TRK RUN position, the standard synchro in the 578M-1 is interconnected to cross track coupling transmitter B6. This position is employed to check the rotational reference of the cross track coupling transmitter B6 against the standard synchro. See figure 4-6. The principles of operation of this circuit are the same as the ALONG TRK RUN position of the FUNCTION SELECTOR as explained in paragraph 4.2.2.1 with the exception that synchro B6 replaces synchro B3, and motor-rate generator MG2 replaces MG1.

4.2.2.7 B1-B2, B4-B5, B7 INDEX POSITIONS. These positions are employed to check the index reference of synchros B1-B2, B4-B5, and B7. The B1-B2 INDEX position allows the connection of an external a-c vtvm into the circuit in order to adjust synchros B1 and B2 for a null. See figure 4-7. Transformer T1 supplies 12 volts, 400 cps to the X and Y stators of synchros B1 and B2. The output from synchro B1 and B2 rotors is read on the external a-c vtvm.

The B4-B5 INDEX position allows the connection of an external a-c vtvm into the circuit in order to null control transformers B4 and B5. See figure 4-8. Transformer T1 supplies 26 volts, 400 cps to the rotors of synchros B4 and B5. The output is obtained from the X and Y stators.

The B7 INDEX position allows the connection of an external a-c vtvm into the circuit in order to null resolver B7. See figure 4-9. Transformer T1 supplies 26 volts, 400 cps to the stator of resolver B7, and the output is obtained from the rotor of resolver B7.

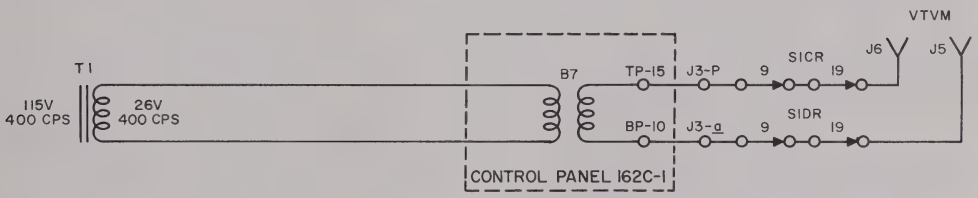

Figure 4-9. B7 INDEX, Simplified Schematic Diagram

SECTION V
MAINTENANCE

5.1 TEST EQUIPMENT REQUIRED.

Refer to table 1-2 for a list of equipment required to bench test and adjust Test Panel 578M-1.

5.2 VOLTAGE TESTS.

5.2.1 TRANSFORMER T1 OUTPUT VOLTAGES.

a. Remove the dust cover, and connect the 578M-1 to 115-volt ±10 percent single-phase, 400-cps ±5 percent power supply. Position the POWER switch to ON, and note that the POWER indicator lamp lights.

b. Measure the output voltages from the transformer T1 of the 578M-1, using the a-c vtvm designated in table 1-2 or its equivalent. The transformer T1 output voltages should be within the limits specified in table 5-1.

TABLE 5-1
TRANSFORMER T1 OUTPUT VOLTAGES

TEST POINT	NORMAL INDICATION
Pin 4 to pin 6	26 volts ±10 percent
Pin 5 to pin 6	12 volts ±10 percent
Pin 3 to pin 6	115 volts ±10 percent
Pin 10 to pin 12	46 volts ±10 percent
Pin 7 to pin 9	6.3 volts ±10 percent

5.2.2 D-C SUPPLY VOLTAGE TEST.

a. Remove the dust cover, and connect the 578M-1 to 115-volt ±10 percent single-phase, 400-cps ±5 percent power. Position the POWER switch to ON, and note that the POWER indicator lamp lights.

b. Measure the d-c supply voltage of 578M-1 to the Control Panel 162C-1 stage switching circuit and to the servo amplifier located within the 578M-1. Use the d-c voltmeter designated in table 1-2 or equivalent. The d-c supply voltage should be within the limits specified in table 5-2.

TABLE 5-2
D-C SUPPLY VOLTAGE

TEST POINT	NORMAL INDICATION
Pin S of J3 to pin E of J3	28 volts ±10 percent
Pin 3 of J1 to pin E of J3	28 volts ±10 percent

5.3 OPERATING TEST.

An operating test of Test Panel 578M-1 is best performed by completing the testing procedure outlined in section III of this manual. A Control Panel 162C-1 known to be in good operating condition must be used.

5.4 TROUBLE-SHOOTING TEST PANEL 578M-1.

5.4.1 Trouble-shooting the 578M-1 may be performed best by checking the continuity of the switch sections using the Volt-Ohm-Milliammeter described in table 1-2 of this manual, and the Test Panel 578M-1 schematic diagram, figure 7-1.

5.5 SERVO AMPLIFIER TROUBLE SHOOTING.

To trouble-shoot the servo amplifier, first remove it from the 578M-1 chassis by loosening the module retaining screws and lifting the module from the chassis.

5.5.1 TEST SETUP.

A d-c power supply is used to supply 27.5 volts d-c directly to the servo amplifier module test jig (figure 5-2). A signal input of one millivolt from the audio oscillator is applied through the module test jig to J1-15.

NOTE

If the audio oscillator is incapable of producing a one-millivolt output, mount a 10K limiting resistor to the positive side of the audio oscillator output, and a 100-ohm limiting resistor to the ground side. Secure these two resistors to the signal input lead wire which connects with pin 15 of connector J1 on the servo amplifier module test jig.

Connect a 300-ohm load to the output of the servo amplifier (pin 9). Pins 5 and 6 of connector J1 are grounded. The voltage at the output should be approximately 6 volts a-c. The voltohmmeter (Triplett 630) is used to obtain d-c voltage readings from the servo amplifier test points shown in figure 5-1.

Measure the voltages at the test points indicated in table 5-3. See figure 5-3 for the location of the test points on the module. The correct response is given in table 5-3. Figure 5-4 illustrates the location of components to aid in trouble shooting.

NOTE

It must be remembered that the parameters of transistors will vary somewhat. The readings given in table 5-3 were obtained from representative servo amplifiers. Other servo amplifiers may have transistors with somewhat different parameters, and the voltage at the test points can be expected to vary accordingly.

TABLE 5-3. SERVO AMPLIFIER VOLTAGE MEASUREMENTS

TEST POINTS	REFERENCE SYMBOL	VALUE	APPROXIMATE D-C POTENTIAL
A to B	C1	10 uf	6
C to D	C2	60 uf	5.75
E to D	C3	0.068 uf	0.47
F to G	C4	10 uf	12
G to D	C5	0.0047 uf	12
H to D	C6	60 uf	13.5
I to D	C7	0.008 uf	0.42
J to D	C8	10 uf	11
L to D	C9	0.01 uf	10.1
L to M	C10	2 uf	10.1
N to D	C11	18 uf	18
A to O	R1	10K	0
A to P	R2	47K	0
P to D	R3	10K	0
B to D	R4	15K	5.2
J to B	R5	18K	6
J to Q	R6	1800	6.1
J to C	R7	2700	5.9
G to R	R9	3900	5
S to R	R10	3300	5
H to R	R11	2700	5
J to R	R12	1000	6
K to L	R13	15	0.4
N to T	R14	15	0.4
R to N	R15	1000	10

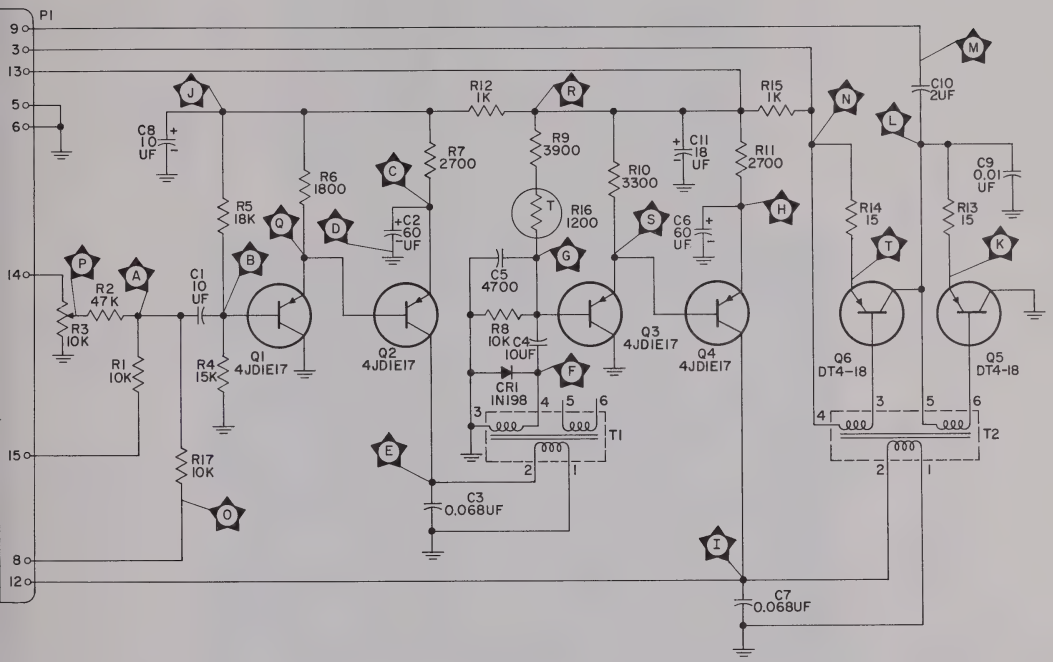

Figure 5-1. Location of Test Points on Servo Amplifier

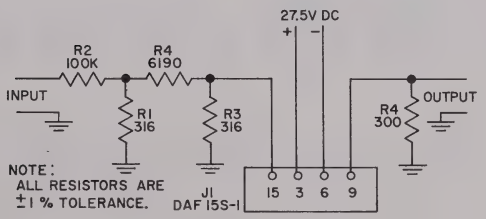

Figure 5-2. Servo Amplifier Module Test Jig, Schematic Diagram

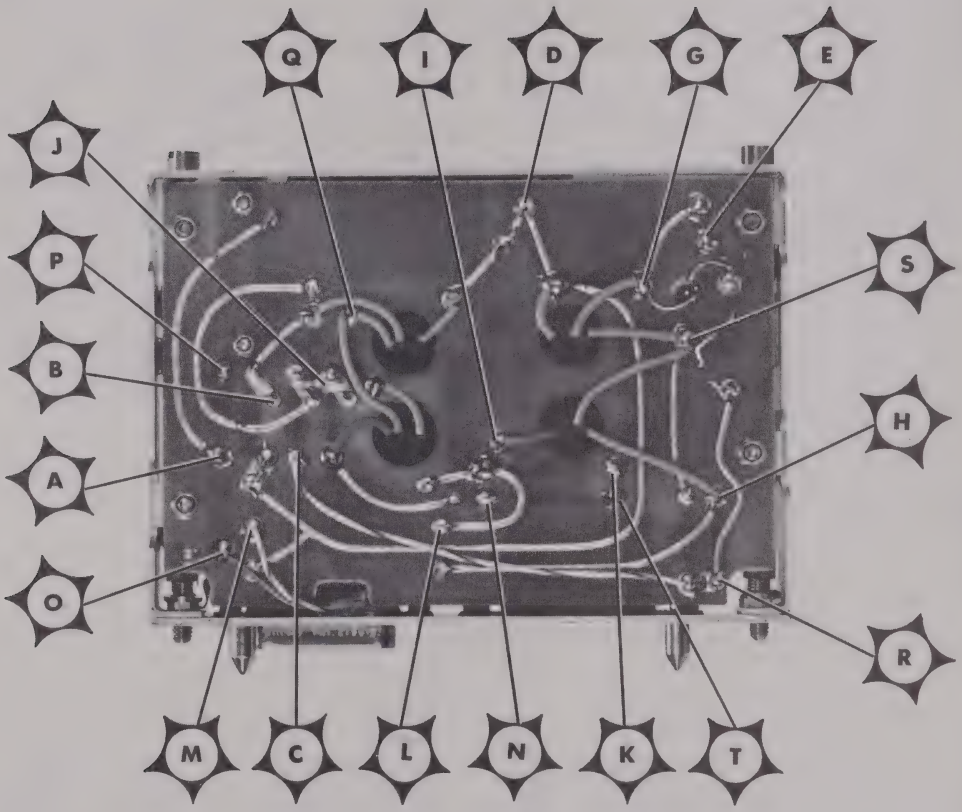

Figure 5-3. Servo Amplifier, Test Point Location

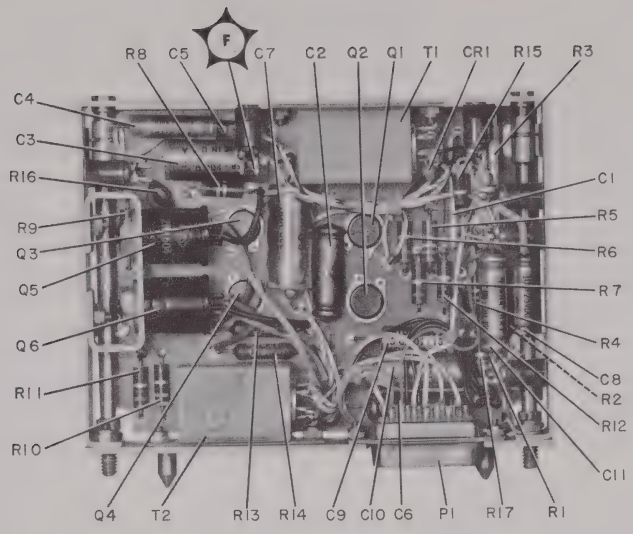

Figure 5-4. Servo Amplifier, Component Location

5.6 DISASSEMBLY - ASSEMBLY INSTRUCTIONS.

5.6.1 DISASSEMBLY.

Before disassembling the 578M-1, perform a complete operation test according to section III of this manual to determine the extent of maintenance required. Disassemble only to the extent required to repair or replace the defective part. If it becomes necessary to replace a defective part, refer to the parts list and its associated illustrations found in section VI of this manual, for parts identification and the corresponding Collins part number.

5.6.2 ASSEMBLY AND ALIGNMENT.

There are no specific assembly instructions. The assembly procedure is essentially the reverse of the disassembly procedure. There are no alignment procedures required for the 578M-1.

5.6.3 CLEANING AND LUBRICATING.

Cleaning procedures should normally be limited to removing dust and dirt from the front panel and dust cover surfaces. Use a soft clean cloth, detergent, and water to accomplish this. At infrequent intervals, it may be necessary to clean the contacts of the FUNCTION SELECTOR switch. To accomplish this, remove the dust cover of the 578M-1, and wash the switch contacts with a soft-bristled brush using an alcohol solvent conforming to Military Specification MIL-A-6091A. There is no lubrication required for any component of the 578M-1.

SECTION VI
PARTS LIST

Test Set 578M-1

ITEM	DESCRIPTION	COLLINS PART NUMBER
	TEST SET 578M-1	522-2063-00
B1	SYNCHRO CONTROL TRANSFORMER: input to stator 11.8 volts, 400 cycles, 0.021 amp, 0.05 w; rotor output 23.5 volts	229-0255-00
B2	MOTOR, A-C: 115-volt a-c, 400-cps, 4-rpm input; 5.0 in. oz. min. at 4.0-rpm output torque	230-0370-00
C1	CAPACITOR, FIXED, ELECTROLYTIC: 50 uf +75% -15%; 50 volts d-c	184-7010-00
C2	CAPACITOR, FIXED, PAPER: 0.1 uf ±20%, 600 volts d-c	931-4584-00
CR1	SEMICONDUCTOR DEVICE, DIODE: silicon; General Electric part no. 1N538	353-1526-00
CR2	SEMICONDUCTOR DEVICE, DIODE: silicon; General Electric part no. 1N538	353-1526-00
DS1	LAMP, INCANDESCENT: 6.3 volts, 0.945 w, 0.15 amp; 1-1/8 in. lg max o/a	262-3240-00
DS2	LAMP, INCANDESCENT: same as DS1	262-3240-00
E1	TERMINAL STANDOFF: brass; 1/4 in. hex by 5/8 in. lg. tapped 4-40 thd, 5/32 in. deep one end	306-0976-00
E2 thru E9	TERMINAL STANDOFF: same as E1	306-0976-00
F1	FUSE, CARTRIDGE: 5 amp, 250 volts, ferrule type terminals	264-4090-00
J1	CONNECTOR, RECEPTACLE ELECTRICAL: 15 female contacts, 5 amp; straight shape	371-0041-00
J2	CONNECTOR, PLUG ELECTRICAL: 3 male contacts; 10 amp, 250 volts, 15 amp, 125 volts	368-0135-00
J3	CONNECTOR, RECEPTACLE ELECTRICAL: 41 female contacts; 7.5 amp, 700 volts d-c; straight shape	371-6081-00
J4	CONNECTOR, RECEPTACLE ELECTRICAL: 1 female contact, 50 ohms; straight shape	357-9307-00
J5	POST, BINDING: plastic cap and base; 41/64 in. od by 1-49/64 in. o/a; 0.098 in. dia wire hole; black	372-1061-00
J6	POST, BINDING: plastic cap and base; 41/64 in. od by 1-49/64 in. o/a; 0.098 in. dia wire hole, red	372-1062-00
P1	CONNECTOR ASSEMBLY, ELECTRICAL: c/o 2 connectors 1 adapter, and 1 shell	546-9268-00
P2	CONNECTOR, PLUG ELECTRICAL: 41 male contacts; 7.5 amp, 700 volts d-c; straight shape	371-6338-00
P3	CONNECTOR, PLUG ELECTRICAL: 3 flat female contacts; 250 volts at 10 amp, 125 volts at 15 amp; straight shape	368-0005-00
R1	RESISTOR, FIXED, COMPOSITION: 1000 ohms ohms ±10%, 1 w	745-3352-00
R2	RESISTOR, FIXED, WIRE-WOUND: 1000 ohms ±3%, 5 w	747-9396-00
S1	SWITCH, ROTARY: 6 section, 9 position, 12 circuit (12 pole) 12 moving contacts, 83 fixed contacts	259-1346-00
S2	SWITCH, TOGGLE: spst, 250 volts d-c at 5 amp, 30 volts d-c at 20 amp resistive; 220 volts a-c, 60 cps at 6 amp, 115 volts a-c at 15 amp resistive	266-5011-00
S3	SWITCH, PUSH: spst; 230 volts a-c max, 7.5 amp nom current rating, 17 amp max nom current 24 volts d-c max	260-1263-00
S4	SWITCH, TOGGLE: same as S2	266-5011-00
T1	TRANSFORMER, POWER, ISOLATION AND STEP-DOWN: pri. 115 volts rms, 360-440 cps; sec. 115.0 volts rms at 0.500 amp, 26.0 volts rms at 1.000 amp, 12.0 volts rms at 0.500 amp, 6.3 volts rms ct at 0.300 amp, 46.0 volts rms ct at 0.250 amp	662-0510-00
TB1	FRONT PANEL SUBASSEMBLY: c/o 2 diodes, 2 capacitors, 2 resistors; 2-1/2 in. by 3-9/32 in. by 1/8 in. thk board dimensions	546-9289-00
	SERVO AMPLIFIER	542-4781-005
A1	WRAP-AROUND BEARING: aluminum; chromate dip; 4-5/16 in. lg by 3-1/16 in. h. 0.050 in. thk	542-6263-004
A2	BRACKET, TRANSISTOR: aluminum; chromate dip; 1-11/32 in. lg by 0.592 in. w by 0.050 in. thk	542-6264-002
A3	PLATE, BASE, BEARING: aluminum; chromate dip; 4-13/32 in. lg by 59/64 in. w by 0.064 in. thk	542-6258-003
C1	CAPACITOR, FIXED, ELECTROLYTIC: 10 uf +75% -15%, 15 volts d-c	184-7226-00
C2	CAPACITOR, FIXED, ELECTROLYTIC: 100 uf, -15% +50%, 50 volts d-c	184-7038-00
C3	CAPACITOR, FIXED, PAPER: 0.068 uf, ±20%, 200 volts d-c	931-4506-00
C4	CAPACITOR, FIXED, ELECTROLYTIC: same as C1	184-7226-00
C5	CAPACITOR, FIXED, PAPER: 0.0047 uf, ±20%, 100 volts d-c	931-9082-00
C6	CAPACITOR, FIXED, ELECTROLYTIC: same as C2	184-7038-00
C7	CAPACITOR, FIXED, PAPER: same as C3	931-4506-00
C8	CAPACITOR, FIXED, ELECTROLYTIC: 10 uf +75% -15%, 25 volts d-c	184-7030-00
C9	CAPACITOR, FIXED, PAPER: 0.01 uf ±20%, 100 volts d-c	931-9078-00
C10	CAPACITOR, FIXED, ELECTROLYTIC: 2 uf, -15% +30%, 150 volts d-c	184-7223-00
C11	CAPACITOR, FIXED, ELECTROLYTIC: 18 uf, +75% -15%, 50 volts d-c	184-7036-00
CR1	SEMICONDUCTOR DEVICE, DIODE: germanium; Transitron Electric type 1N198	353-0160-00
E1	TERMINAL, STUD: brass conductor; 1/4 in. hex; 0.632 in. lg	306-0234-00
E2 thru E4	TERMINAL, STUD: same as E1	306-0234-00
E5	TERMINAL, LUG: bronze; rd tongue end; 0.020 in. thk. by 3/16 in. od by 13/32 in. lg	304-0332-00
E6	TERMINAL, LUG: same as E1	304-0234-00
E7	TERMINAL, LUG: same as E1	304-0234-00
H1	WASHER, NONMETALLIC: mica; 0.500 in. od, 0.203 in. id, 0.004 in. thk	302-0410-00
H2	WASHER, FLAT: electrolytic tough pitch copper; 0.500 in. od, 0.172 in. id, 0.036 in. thk	310-0452-00
H3	NUT, PLAIN, HEXAGON: copper; 8-32 NC-2B thd, 0.343 in. w across flats, 0.130 in. h o/a	313-0188-00
H4	NUT, SELF-LOCKING, HEXAGON: aluminum allow; 2-56 NC-3B thd, 0.158 in. w across flats, 0.095 in. h. o/a	333-0604-00
H5	NUT, SELF-LOCKING, HEXAGON: aluminum alloy; 4-40 NC-3B thd; 0.190 in. w. across flats, 0.110 in. h. o/a	333-0605-00
H6	RING, RETAINING: beryllium copper; 0.114 in. id, 0.282 in. od, 0.025 in. thk	340-0252-00
H7	RING, RETAINING: copper, split ring type; 0.309 in. id, 0.025 in. thk	340-0042-00
H8	WASHER, FLAT: CRES: 0.171 in. id, 0.250 in. od, 0.018 in. thk	542-1590-003
H9	SCREW, EXTERNALLY RELIEVED BODY: CRES; 0.234 in. dia, 3.496 in. lg, 8-32 NC-2A, 11/32 in. slotted head	542-6158-002
H10	FERRULE, ELECTRICAL CONDUIT: plastic, varnish finish; 0.250 in. od by 0.171 in. id by 0.040 in. thk	542-6161-002
O1	PIN, LOCATING: stainless steel, passivated; 0.184 in. dia. by 11/32 in. lg. undercut to 0.124 in. dia, 0.096 in. lg; 0.4397 in. lg o/a; one end drilled 0.093 in. dia by 3/32 in. deep	540-7766-002
O2	PIN, LOCATING: CRES; one end tapered end, opposite end undercut to 0.124 in. dia, 0.096 in. lg tapped 0.093 in. dia by 3/32 in. deep, 0.184 in. od by 0.40775 in. lg o/a	540-7763-002
P1	CONNECTOR, RECEPTACLE, ELECTRICAL: 15 male contacts; straight shape	371-0020-00
Q1	TRANSISTOR: germanium; General Electric type 4JD1A-17	352-0009-00
Q2 thru Q4	TRANSISTOR: same as Q1	352-0009-00
Q5	TRANSISTOR: germanium; C.B.S. -Hytron DT4-18	352-0044-00
Q6	TRANSISTOR: same as Q5	352-0044-00
R1	RESISTOR, FIXED, COMPOSITION: 10,000 ohms ±10%, 1/2 w	745-1394-00
R2	RESISTOR, FIXED, COMPOSITION: 47,000 ohms ±10%, 1/2 w	745-1422-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
R3	RESISTOR, VARIABLE WIRE-WOUND: 10,000 ohms ±10%, 0.8 w	381-1114-00
R4	RESISTOR, FIXED, COMPOSITION: 15,000 ohms ±10%, 1/2 w	745-1401-00
R5	RESISTOR, FIXED, COMPOSITION: 18,000 ohms ±10%, 1/2 w	745-1405-00
R6	RESISTOR, FIXED, COMPOSITION: 1800 ohms ±10%, 1/2 w	745-1363-00
R7	RESISTOR, FIXED, COMPOSITION: 2700 ohms, ±10%, 1/2 w	745-1370-00
R8	RESISTOR, FIXED, COMPOSITION: same as R1	745-1394-00
R9	RESISTOR, FIXED, COMPOSITION: 3300 ohms ±10%, 1/2 w	745-1373-00
R10	RESISTOR, FIXED, COMPOSITION: same as R9	745-1373-00
R11	RESISTOR, FIXED, COMPOSITION: same as R7	745-1370-00
R12	RESISTOR, FIXED, COMPOSITION: 1000 ohms ±10%, 1/2 w	745-1352-00
R13	RESISTOR, FIXED, WIRE-WOUND: 15 ohms ±1%, 2 w	746-9305-00
R14	RESISTOR, FIXED, WIRE-WOUND: same as R13	746-9305-00
R15	RESISTOR, FIXED, COMPOSITION: same as R12	745-1352-00
R16	RESISTOR, THERMAL: 1200 ohms at 25 degrees C w/resistance constant of 3800 ohm ±10%	714-1564-00
R17	RESISTOR, FIXED, COMPOSITION: same as R1	745-1394-00
T1	TRANSFORMER, AUDIO FREQUENCY: plate coupling type; 2000 ohms pri, 4 ma; 360 to 440 cps; 200, 200 ohms sec, 0 ma	677-1069-00
T2	TRANSFORMER, AUDIO FREQUENCY: same as T1	677-1069-00
TB1	TERMINAL BOARD: plastic, copper-clad glass epoxy; 1/16 in. thk, 4-1/4 in. lg by 3-1/32 in. h	546-4211-00
	COMMERCIAL HARDWARE	
	WASHER, LOCK: CRES; 0.168 id, 0.296 od, 0.040 in. thk (qty 4)	310-0072-00
	SCREW, MACHINE: CRES; 4-40 NC-2A thd, Phillips recessed flathead, 3/16 in. lg (qty 6)	342-0043-00
	SCREW, MACHINE: CRES; 4-40 NC-2A thd, Phillips recessed flathead, 1/4 in. lg (qty 10)	342-0044-00
	SCREW, MACHINE: stainless steel; flathead, 4-40 NC-2A thd, 5/16 in. lg (qty 4)	342-0045-00
	SCREW, MACHINE: CRES; Phillips recessed flathead, 2-56 NC-2A thd, 1/4 in. lg (qty 2)	342-0133-00
	SCREW, MACHINE: CRES; Phillips panhead; 2-56 NC-2A thd; 1/2 in. lg (qty 2)	343-0128-00
	WASHER, LOCK: CRES; 0.088 in. id, 0.175 in. od, 0.020 in. thk (qty 8)	310-0275-00
	WASHER, LOCK: stainless steel; 0.115 in. id, 0.202 in. od, 0.020 in. thk (qty 4)	310-0278-00
	WASHER, LOCK: CRES; 0.115 in. id, 0.212 in. od, 0.040 in. w, 0.025 in. thk (qty 23)	310-0279-00
	WASHER, LOCK: CRES; 0.141 in. id, 0.253 in. od, 0.031 in. thk (qty 10)	310-0282-00
	WASHER, LOCK: CRES; 0.255 in. id, 0.493 in. od, 0.062 in. thk (qty 4)	310-0288-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
	WASHER, FLAT: CRES; 0.092 in. id, 7/32 in. od, 0.018 in. thk (qty 2)	310-6320-00
	WASHER, FLAT: electrolytic tough pitch copper; 0.500 in. od, 0.172 in. id, 0.036 in. thk (qty 2)	310-0452-00
	MACHINE SCREW NUT: stainless steel; 8-32 thd, 11/32 in. lg 1/8 in. thk (qty 2)	313-0017-00
	NUT, PLAIN, HEXAGON: CRES; 2-56 thd, 3/16 in. hex by 1/16 in. thk (qty 1)	313-0037-00
	NUT, PLAIN, HEXAGON: CRES; 6-32 thd, 1/4 in. hex. 3/32 in. thk (qty 6)	313-0045-00
	NUT, PLAIN, HEXAGON: CRES; 1/4-28 NF-2 thd, 3/8 in. hex, 1/8 in. thk (qty 4)	313-0083-00
	NUT, HEXAGON: CRES; 4-40 NC-2 thd; 3/16 in. across flats, 1/16 in. hex (qty 4)	313-0132-00
	NUT, SELF-LOCKING, HEXAGON: aluminum alloy; 2-56 NC-3B thd, 0.158 in. w across flats, 0.095 in. o/a h (qty 10)	333-0604-00
	NUT, SELF-LOCKING, HEXAGON: aluminum alloy; 4-40 NC-3B thd, 0.190 in. w across flats, 0.110 in. o/a h (qty 4)	333-0605-00
	NUT, SELF-LOCKING, CLINCH: carbon steel; 2-56 NC-3B thd; 0.075 in. lg, 0.172 in. w, 0.135 in. h (qty 11)	333-0838-00
	NUT, SELF-LOCKING, CLINCH: carbon steel; 4-40 NC-3B thd, 0.203 in. lg, 0.187 in. w, 0.150 in. h (qty 14)	333-0840-00
	NUT, SELF-LOCKING, CLINCH: alloy steel; 8-32 NC-3B thd, 0.312 in. lg, 0.281 in. w 0.220 in. h (qty 14)	333-0844-00
	SETSCREW: stainless steel; headless, 8-32 NC-2A thd, 1/8 in. lg (qty 2)	335-0024-00
	SETSCREW: stainless steel; 2-56 NC-3A thd; 3/16 in. lg (qty 4)	335-0053-00
	SCREW, MACHINE: stainless steel; Phillips recessed 80 degrees to 82 degres flathead, 6-32NC-2A thd, 3/8 in. lg (qty 8)	342-0062-00
	SCREW, MACHINE: stainless steel; 8-32 NC-2A thd, Phillips recessed 80 degrees to 82 degrees flathead; 5/8 in. lg (qty 8)	342-0081-00
	SCREW, MACHINE: CRES; Phillips recessed flathead, 2-56 NC-2A thd, 5/16 in. (qty 9)	342-0136-00
	SCREW, MACHINE: CRES; Phillips recessed flathead, 2-56 NC-2A thd, 1/8 in. lg (qty 4)	343-0122-00
	SCREW, MACHINE: CRES; Phillips panhead, 2-56 NC-2A thd, 3/16 in. lg (qty 8)	343-0123-00
	SCREW, MACHINE: CRES; Phillips panhead, 2-56 NC-2A thd, 1/4 in. lg (qty 3)	343-0124-00
	SCREW, MACHINE: CRES; Phillips recessed panhead, 4-40 NC-2A thd, 1/4 in. lg (qty 25)	343-0133-00
	SCREW, MACHINE: stainless steel; panhead, 4-40 NC-2A thd, 5/16 in. lg (qty 2)	343-0134-00
	SCREW, MACHINE: CRES; Phillips panhead, 6-32 NC-2A thd, 1/4 in. lg (qty 2)	343-0167-00
	SCREW, MACHINE: stainless steel, panhead, 8-32 NC-2A thd, 7/16 in. lg (qty 4)	343-0188-00
	SCREW, MACHINE: brass; Phillips recessed panhead, 4-40 NC-2A thd, 3/8 in. lg (qty 4)	343-0287-00
	SCREW, MACHINE: brass; Phillips recessed panhead, 6-32 NC-2A thd, 3/8 in. lg (qty 8)	343-0330-00

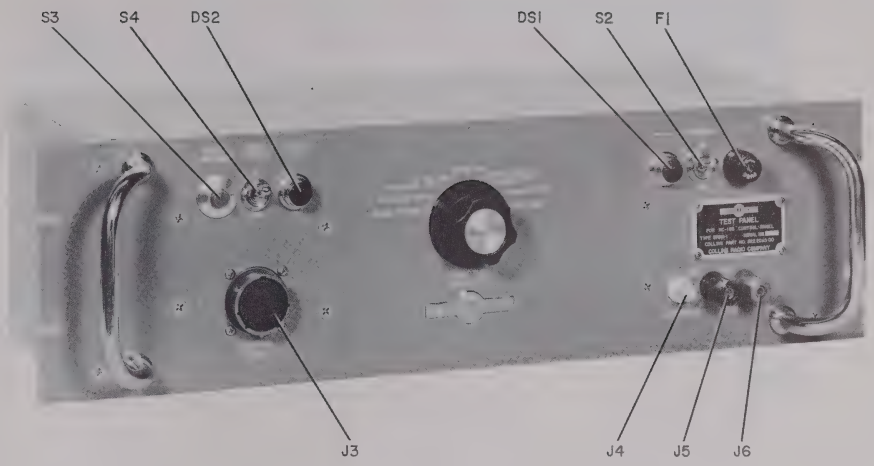

Figure 6-1. Test Panel 578M-1, Front Panel View

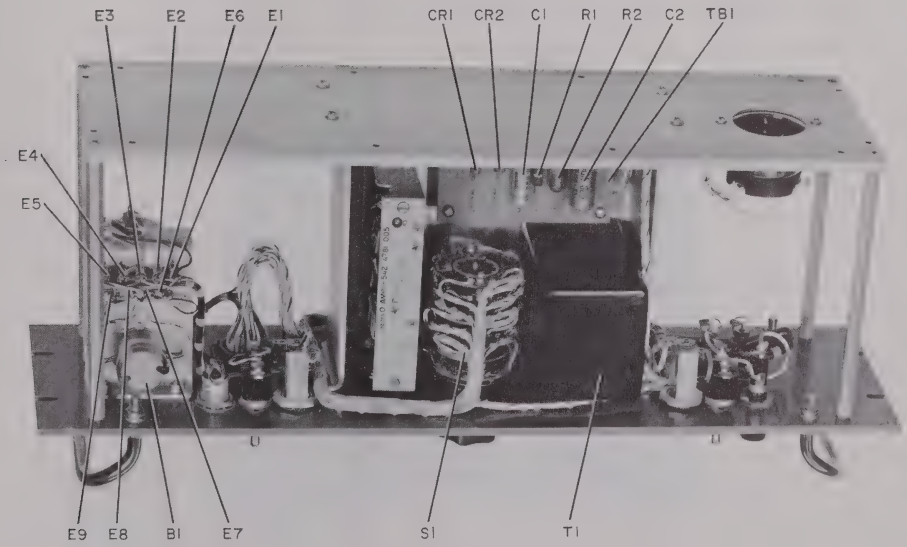

Figure 6-2. Test Panel 578M-1, Top View

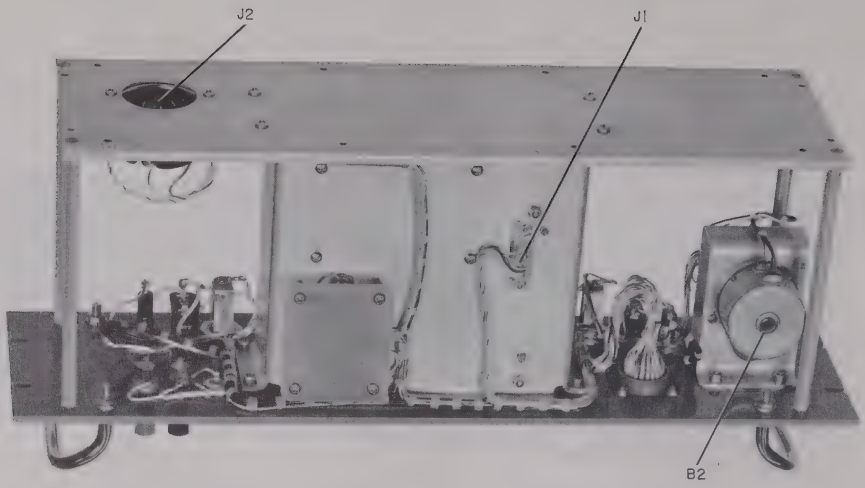

Figure 6-3. Test Panel 578M-1, Bottom View

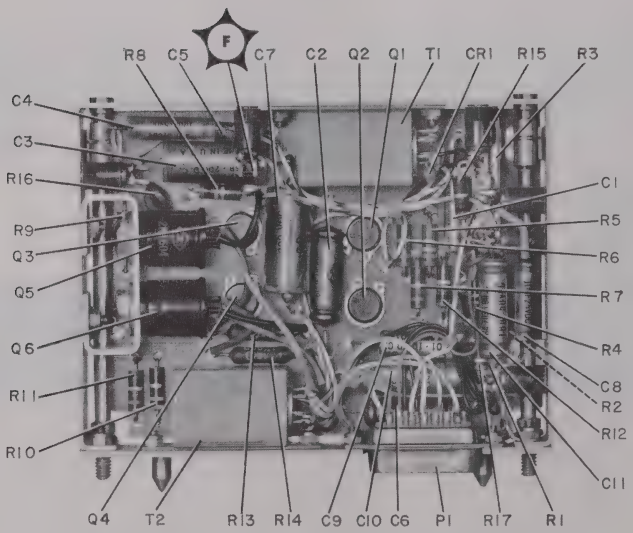

Figure 6-4. Servo Amplifier, Component Location

SECTION VII
ILLUSTRATIONS

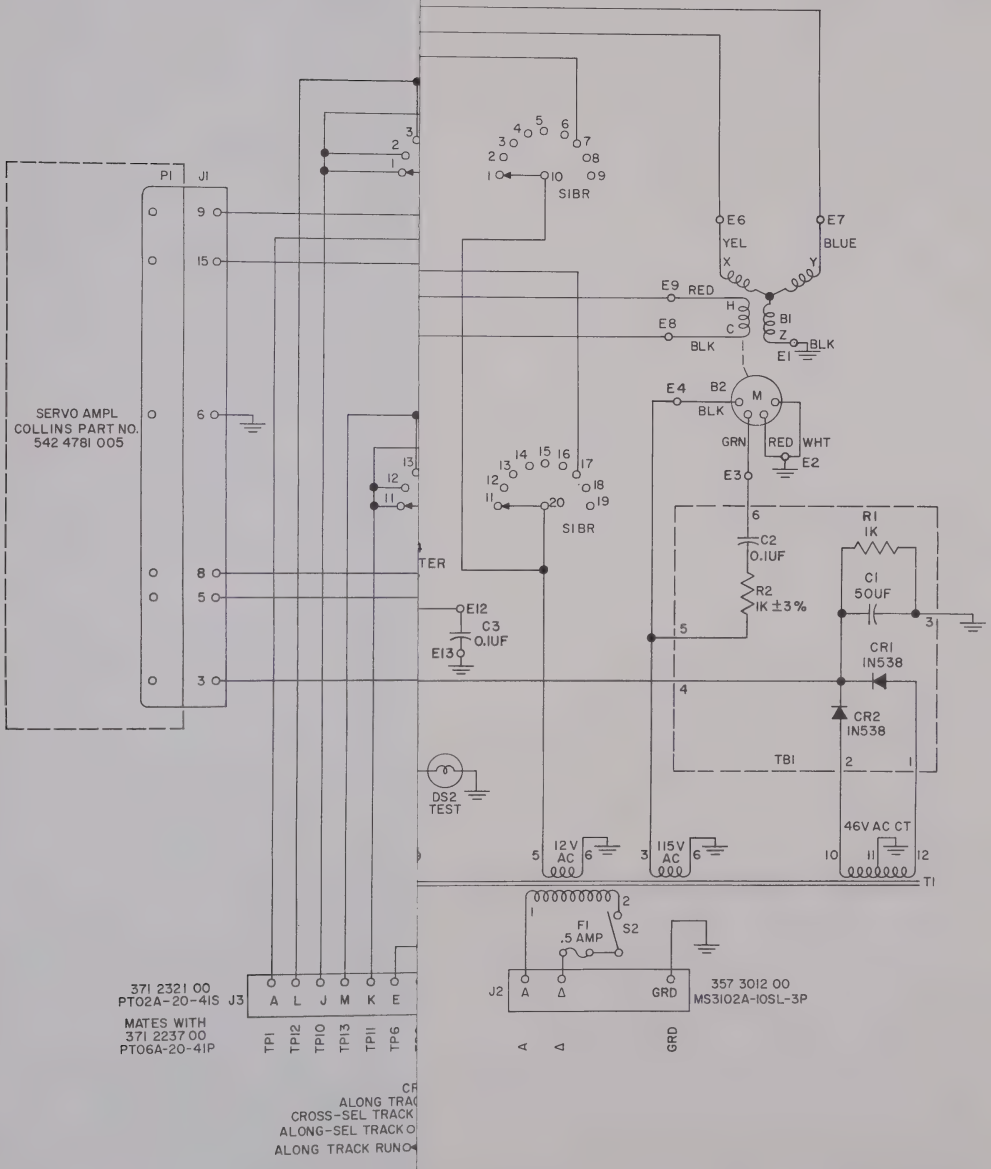

Figure 7-1. Test Panel 578M-1, Schematic Diagram

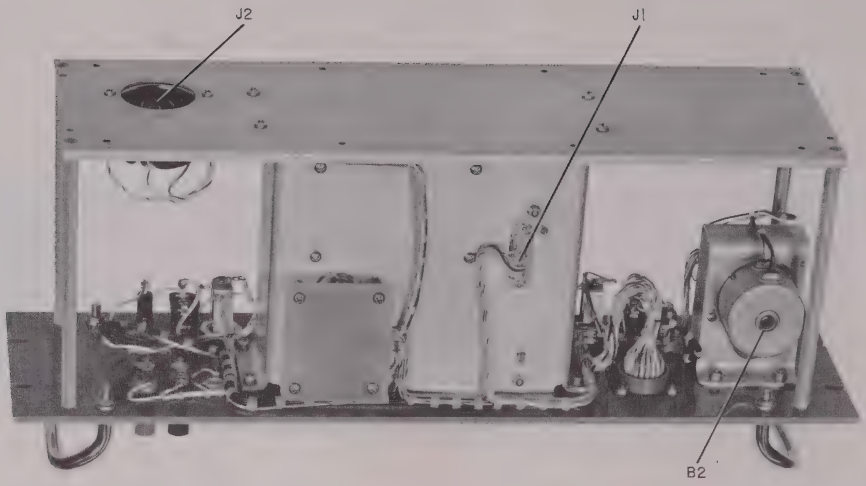

Figure 6-3. Test Panel 578M-1, Bottom View

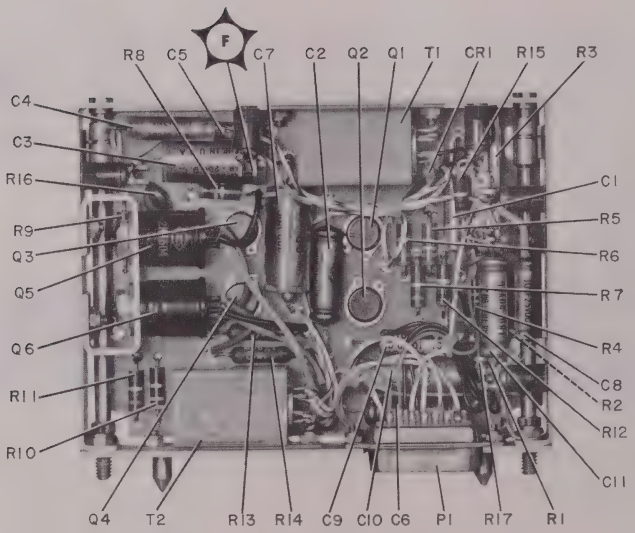

Figure 6-4. Servo Amplifier, Component Location

SECTION VII
ILLUSTRATIONS

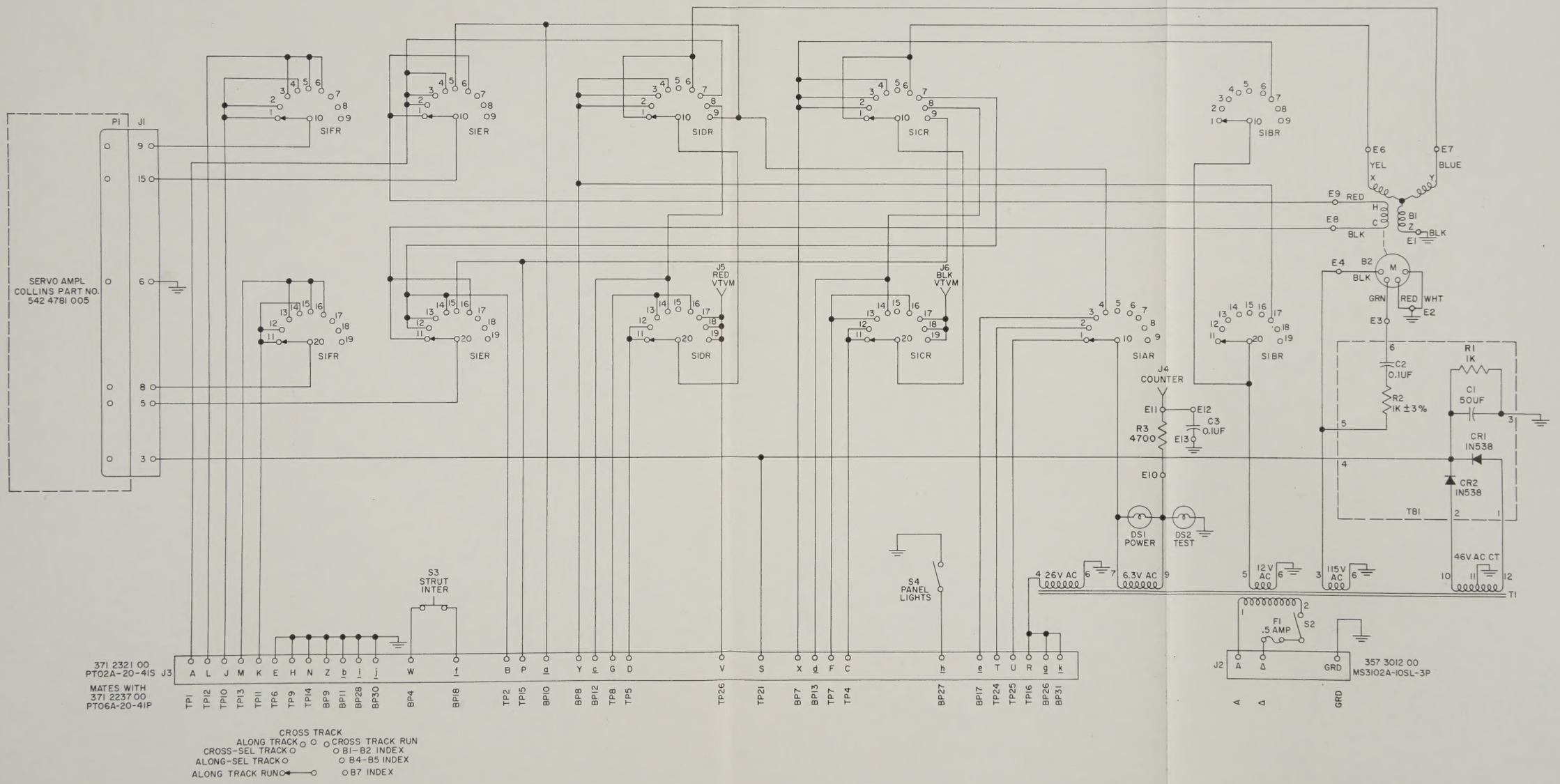

Figure 7-1. Test Panel 578M-1, Schematic Diagram

ELECTRICAL WIRE CODE

EXAMPLES

UNSHIELDED WIRE, MIL TYPE B #22 AWG, WHITE WITH RED AND GREEN TRACERS:

D	A	9	25	——	4-1/4
Type of Wire	Size of Wire	Color of Body	Color of Tracers		Length of Wire in Inches (Includes Stripping & Tinning)

SHIELDED WIRE (SINGLE), MIL TYPE C, #15 AWG, WHITE WITH RED AND GREEN TRACERS:

R	D	S	9	25	——	4-1/4
Type of Wire	Size of Wire	Shielded	Color of Body	Color of Tracers		Length of Wire in Inches (Includes Stripping & Tinning)

SHIELDED WIRE (MULTIPLE), MIL TYPE B, #22 AWG, WHITE, AND WHITE WITH RED TRACER:

D	A	S	(9)	(92)	——	4-1/4
Type of Wire	Size of Wire	Shielded	First Conductor	Second Conductor		Length of Wire in Inches (Includes Stripping & Tinning)

TYPE OF WIRE CODE		
LETTER	TYPE OF WIRE	FAMILY USUALLY FOUND IN
A	Cotton Braid Over Plastic (Formerly AN-J-C-48)	440 Plain 443 Shielded
B	Busbar, Round Tinned	421
C	MIL-W-16878 Type B (#20 and Larger) (600 Volts)	439
D	Miniature Wire, MIL-W-16878 Type B (#22 & Smaller)	439-7000 Series
E		
F	Extra Flexible Varnished Cambric	423
G		
H	Kel-F (Monochloro-trifluoroethylene)	422
J		
K	Neon Sign Cable (15,000 Volts)	423 0004 00
L	Silicone	425 0942 00
M		
N	Single Conductor Stranded (Not Rubber Covered)	422
P	Single Conductor Stranded (Rubber Covered)	423
Q		
R	MIL-W-16878 Type C (1000 Volts)	439 1000 Series
T	Teflon, MIL-W-16878 Type E (600 Volts)	439 4000 Series
V	MIL-W-16878 Type D (3000 Volts)	439 3000 Series
W	Teflon, MIL-W-16878 Type EE (1000 Volts)	439 0000 Series
X		
Y		
Z	Acetate Yarn Telephone Type	428

SIZE OF WIRE CODE	
LETTER	SIZE
A	#22 AWG
B	#20
C	#18
D	#16
E	#14
F	#12
G	#10
H	#8
J	#6
K	#4
L	#2
M	#1
N	#0
P	#00
Q	#000
R	#0000
T	#28
V	#26
W	#24
X	#19
Y	#30
Z	

COLOR CODE	
NUMBER OR LETTER	COLOR
0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Gray (Slate)
9	White
a	Clear
b	Tan
c	Pink
d	Maroon
e	Light Green
f	Light Blue

COLLINS RADIO COMPANY